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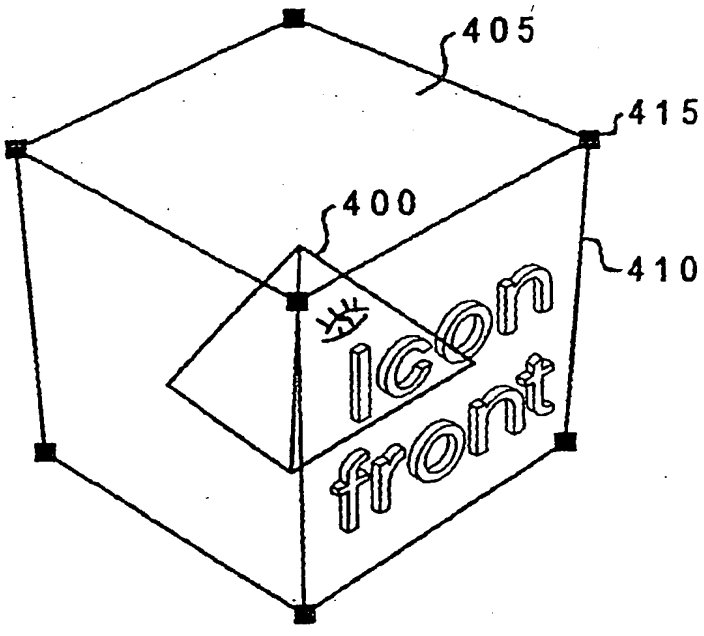
(54) Title: DYNAMICALLY RE-SIZABLE 3D ICONS FOR WINDOWING, BROWSER, OR GRAPHICAL USER INTERFACES



(57) Abstract: A system and method is provided which allow each 3D icon (400) on the desktop to be dynamically transformed, resized, or reshaped using a mouse or any other input device available to the user. The 3D icons may be bitmapped-based or vector-based, and when the user desires to manipulate the icon, a framework (405) of "handles" (415) is used to transform the icon as desired.

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DYNAMICALLY RE-SIZABLE 3D ICONS FOR WINDOWING, BROWSER, OR GRAPHICAL USER INTERFACES

BACKGROUND OF THE INVENTION

1. Technical Field:

The present invention generally relates to computer systems with graphical user interfaces and in particular to icon representation in a computer system with a graphical user interface. Still more particularly, the present invention relates to the manipulation of three-dimensional icons in a computer system with a graphical user interface.

2. Description of the Related Art:

In recent years, virtually all personal computers and workstations have adopted a graphical user interface (GUI) environment, which allows the user to manage the system and execute applications using a "point-and-click" method on objects shown on the computer display. The main GUI background is commonly referred to as the "desktop", and these objects typically include graphic icons, which represent some software application or function, and windows, which divide the desktop into different areas on the display for different applications.

Even more recently, as graphics processing systems have become more robust and less expensive, 3-dimensional (3D) graphics are becoming more commonplace. Originally found only in computer-aided design systems, some modelling systems, and some advanced gaming systems, 3D graphics are now seen on internet web pages, spreadsheets, and other common applications. Further, GUI computer interfaces are beginning to move from a common 2-dimensional (2D) perspective to a more visually stunning 3D perspective.

A 3D GUI interface allows different windows to appear to be actually in front of or behind one another, instead of simply overlapping as in conventional systems. Further, the 3D desktop can be "rotated in space" on the computer display. The icons in such a system are no longer a simple 2D picture, but are instead 3D objects.

Unfortunately, current systems with 3D GUI interfaces do not allow for any real manipulation of the icons. Of course, they may be moved around on the desktop, but more sophisticated manipulation is not available. It would be desirable to have a system which allows the user to manipulate

the size, shape, and orientation of the icons, to take full advantage of the 3D GUI interface.

SUMMARY OF THE INVENTION

It is therefore one objectEmbodiments of the present invention seek to provide a computer system with an improved graphical user interface.

It is another objectEmbodiments of the present invention also seek to provide improved icon representation in a computer system with a graphical user interface.

It is yet another objectEmbodiments of the present invention seek further to provide improved manipulation of three-dimensional icons in a computer system with a graphical user interface.

The foregoing objects are achieved as is now described. According to one aspect of the present invention a method for displaying icons on a computer system, comprises the steps of:

Displaying an graphic icon on a computer display;

when the icon is selected, displaying a manipulation graphic corresponding to the icon; and

as the manipulation graphic is altered by a user, altering the size, shape, and rotation of the icon on the display accordingly,

wherein the manipulation graphic is altered in three dimensions.

According to a second aspect of the present invention a method for displaying icons on a computer system, comprises the steps of:

displaying an graphic icon on a computer display;

when the icon is selected, displaying a manipulation graphic corresponding to the icon;

as the manipulation graphic is altered by a user, altering the size, shape, and rotation of the manipulation graphic accordingly; and

when the user has finished altering the manipulation graphic, altering the size, shape, and rotation of the icon to correspond to the modified size, shape, and rotation of the manipulation graphic, and displaying the altered icon,

wherein the manipulation graphic is altered in three dimensions.

According to a third aspect of the present invention a data processing system, comprises:

a microprocessor;

a memory connected to be written to and read from by the microprocessor;

a display operatively connected to be written to by the microprocessor; and

a user input device connected to be read by the microprocessor,

wherein a three-dimensional user interface and three-dimensional icons are displayed on the display, and the size and shape of the icons can be manipulated in three dimensions using the user input device.

According to a fourth aspect of the present invention a computer program product within a computer usable medium, comprising:

instructions for displaying an graphic icon on a computer display;

instructions for enabling the icon to be selected by a user;

instructions for displaying a manipulation graphic corresponding to the icon when a user has selected the icon;instructions for modifying the size, shape, and rotation of the manipulation graphic according to how the manipulation graphic is manipulated by a user;

instructions for modifying the size, shape, and rotation of the icon to correspond to the modified size, shape, and rotation of the manipulation graphic, when the user has finished manipulating the manipulation graphic; and

instructions for displaying the modified icon,

wherein the manipulation graphic is manipulated in three dimensions.

A system and method is provided which allow each 3D icon on the desktop to be dynamically transformed, resized, or reshaped using a mouse or any other input device available to the user. The 3D icons may be bitmapped-based or vector-based, and when the user desires to manipulate the icon, a framework of "handles" is used to transform the icon as desired.

The above as well as additional objectives, features, and advantages of the present invention will become apparent in the following detailed written description.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction withFor a better

understanding of the present invention reference will now be made, by way of example to the accompanying drawings, wherein:

Figure 1 depicts a data processing system in accordance withwhich a preferred embodiment of the present invention may be implemented;

Figure 2 is a flowchart of a process in accordance with a preferredan embodiment of the present invention;

Figure 3 depicts an exemplary 3D icon in accordance with a preferredan embodiment of the present invention;

Figure 4 is a manipulation graphic in accordance with a preferredan embodiment of the present invention; and

Figures 5-11 depict exemplary icon-manipulation actions in accordance with a preferredn embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the figures, and in particular with reference to Figure 1, a block diagram of a data processing system in which a preferred embodiment of the present invention may be implemented is depicted. Data processing system 100 may be, for example, one of the computers available from International Business Machines Corporation of Armonk, New York. Data processing system 100 includes processors 101 and 102, which in the exemplary embodiment are each connected to level two (L2) caches 103 and 104, respectively, which are connected in turn to a system bus 106.

Also connected to system bus 106 is system memory 108 and Primary Host Bridge (PHB) 122. PHB 122 couples an I/O bus 112 to system bus 106, relaying and/or transforming data transactions from one bus to the other. In the exemplary embodiment, data processing system 100 includes a graphics adapter 118 connected to I/O bus 112, for receiving user interface information for display 120. Peripheral devices such as nonvolatile storage 114, which may be a hard disk drive, and keyboard/pointing device 116, which may include a conventional mouse, a trackball, or the like, are connected via an Industry Standard Architecture (ISA) bridge 121 to I/O bus 112. PHB 122 is also connected to PCI slots 124 via the I/O bus 112.

The exemplary embodiment shown in Figure 1 is provided solely for the purposes of explaining the invention and those skilled in the art will recognize that numerous variations are possible, both in form and function. For instance, data processing system 100 might also include a compact disk read-only memory (CD-ROM) or digital video disk (DVD) drive, a sound card and audio speakers, and numerous other optional components. All such variations are believed to be within the spirit and scope of the present invention. Data processing system 100 and the exemplary icon figures below are provided solely as examples for the purposes of explanation and are not intended to imply architectural limitations.

The preferred embodiment of the invention comprises a system and method for a user to dynamically transform, resize, or reshape 3D icons using any input device available to the user, such as but not limited to, a mouse. The 3D icons may be bitmapped-based or vector-based.

Referring now to Figure 3, in a 3D graphical user interface, the user sees windows or a virtual desktop that stretch into the third dimension or "Z" axis. Upon these windows or desktops there are 2D or 3D icons. The 3D icons are either bitmapped graphics or vector-based graphics. Users can re-size the icons so that they protrude or "stick out/behind" the window onto which they are placed, and so that as the windows or desktops are rotated around their z-axis, some of the icons appear to protrude from the plane in which they are anchored. Figure 3 shows an exemplary 3D icon 300, which for the sake of simplicity is a pyramid, with an "eye" graphic on one face to differentiate it from the other faces of the icon. Of course, in practice, the icon could be of any shape, and would typically be coloured.

With reference now to Figure 4, the preferred embodiment of the invention provides the ability for a user to transform and rotate the 3D icon by designing the icons with built-in edge lines and point "handles" that can be selected and pulled on in order to stretch the icon. The edge lines and the handles, which are small movable cubes along the edge lines and at junctures between them, are normally not visible when the icon is in its normal state.

Figure 4 shows a cubic frame 405 formed around icon 400. The frame 405 is formed of multiple edgelinesedge lines 410, and each visible edgelineedge line juncture has a block handle 415. In Figure 4 (and following figures), one side of the cube formed by the frame is labelled "icon front" to distinguish it from the other sides, to aid in showing

icon manipulation. It should be noted that the designation of one side as the "front" is arbitrary, and is purely for illustrative purposes.

In Figure 4, frame 405 is shown as transparent with regard to icon 400 (although no edgelinesedge lines from the "hidden" faces of cube 405 are shown). This is merely a preferred means for showing the icon manipulation frame 405; in practice, all edgelinesedge lines (including those from hidden faces) can be shown, or the frame can form a solid cube, and the icon 400 hidden from sight, as described below. In the following figures, for the sake of clarity, the icon inside the frame/cube is not shown.

The user can activate the icon re-size mode or state for that icon via a selection mechanism, e.g., by clicking the right mouse button, and selecting a 3D re-size option from a context menu. According to the preferred embodiment, this will form a 3D dimensional frame or shape around the icon, such as a cube, cone, or 3D rectangle, but can also be an irregular shape. As shown in Figures 4-11, a cube (e.g. 400) is used here as an illustrative example. Note that as the dimensions of the shape are manipulated, it will, of course, no longer represent a cube.

According to an alternate method for stretching a 2D or 3D icon, and with reference now to Figure 5, the user can activate the icon re-size mode for that icon via a selection mechanism, e.g., by clicking the right mouse button, and selecting a 3D re-size option from a context menu. A 3D cube of a visible colour (compared with the background colours) will appear around (but not necessarily totally containing) the icon with handles on each of its corners, and it will appear in the same orientation that as the current orientation of the selected icon. Figure 5 shows a cube 500, as in the cubic frame of Figure 4, with one side 510 labelled "icon front," to correspond with the front side of the icon to be manipulated. Of course, any solid object representation can be used in place of a cube to allow the icon manipulation.

Figure 5 is also used to illustrate some of the basic manipulations which can be performed on the cube 500 and in turn on the icon itself (not shown in these figures). Arrows 530 and 540 indicate two of the directions in which the user can "drag" handle 520, and would not actually appear on the display.

If, for example, handle 520 is dragged "up and over" cube 500, as indicated by arrow 530, the cube 500 will be rotated in the direction of

the arrow. If, for example, the user dragged the handle 520 90 degrees "up," the cube would be left laying "face up," as shown in Figure 6.

As another example, handle 520 can be dragged to the left of cube 500, as indicated by arrow 540, the cube 500 would be rotated in the direction of the arrow. If, for example, the user dragged the handle 520 90 degrees left, the cube would be face left, as shown in Figure 7.

Figures 8-11 show examples of sizing manipulations performed on the manipulation cube shown in Figure 5. Figure 8 shows a block figure 800 as the manipulation cube would appear after a user has dragged handle 810 in the direction of arrow 820, here designated as the Y-axis, to reduce the depth of the figure. Figure 9 shows a block figure 900 as the manipulation cube would appear after a user has dragged handle 910 in the direction of arrow 920, here designated as the Z-axis, to reduce the height of the figure. Figure 10 shows a block figure 1000 as the manipulation cube would appear after a user has dragged handle 1010 in the direction of arrow 1020, here designated as the X-axis, to reduce the width of the figure.

Of course, these manipulations can be combined, as shown in Figure 11. Here, block figure 1100 represents the result of shrinking Y-axis of the manipulation block of Figure 5 by one-half, and increasing the X-axis by one third. Of course, other manipulations may also be combined with other rotation or transformation operations.

Each time the shape or orientation of the icon is manipulated, by manipulating the manipulation frame or cube, the icon must be redrawn in accordance with the user's changes. On fast processors, the redraw can occur in real-time, as the icon is being manipulated; on other systems, the icon can be redrawn after manipulation is complete. The logic that will re-paint the icon can be self-contained in an icon object or class, or the graphical user interface can handle the re-painting based on vector information that the icon object or class provides. The actual drawing and painting of the icons are done by any conventional means, well within the abilities of one of skill in the art.

2D icons will be able to be stretched on their x, y, and z axis as well, which would effectively turn a 2D icon into a 3D icon. The user can point to one of the handles, and drag the handle to a new position, and in the same manner in which the cube (or other outline shape) rotates or is re-sized, the icon will be rotated or re-sized on all 3 axis. Anchor

points within the icon onto the plane onto which they are connected should be respected. The user can click on another desktop object or select from a context sensitive menu in order to indicate to the system that the re-size action is completed and the handles, along with the lines indicating the edges of the re-size mode shape, will disappear leaving the transformed icon. The graphical user interface will repaint the icon with its new orientation/ size. According to the preferred embodiment, the operating environment or icon object itself preserves the new setting for future use.

With reference now to Figure 2, a flowchart of the basic process described above is shown. A system according to the preferred embodiment will display icons in a 3D environment on the computer "desktop" (step 200). When the user desires to edit the icon, he selects it for edit, e.g., by a pop-up menu (step 210). The manipulation handles are then displayed (step 220), and can be accompanied by edgelines and/or a default solid shape, to show how the icon is being manipulated. Using a mouse or other device to move the manipulation handles, the user resizes and reshapes the icon according to his preference (step 230). Finally, the icon is redrawn to its new size and shape (step 240). Of course, the redrawing step may take place as the manipulation handles are being moved, so that the icon is resized/reshaped in real time.

It is important to note that while the present invention has been described in the context of a fully functional data processing system and/or network, those skilled in the art will appreciate that the mechanism of the present invention is capable of being distributed in the form of a computer usable medium of instructions in a variety of forms, and that the present invention applies equally regardless of the particular type of signal bearing medium used to actually carry out the distribution. Examples of computer usable mediums include: nonvolatile, hard-coded type mediums such as read only memories (ROMs) or erasable, electrically programmable read only memories (EEPROMs), recordable type mediums such as floppy disks, hard disk drives and CD-ROMs, and transmission type mediums such as digital and analog communication links.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope of the invention. For example, while the preferred embodiment is presented in the context of icons on a GUI desktop, the same principles can be advantageously applied

to other objects on the desktop, or icons and objects in an Internet browser window. Further, while in the preferred embodiment the user uses a mouse to manipulate the icon, this manipulation can be done by any user input means, including (but not limited to) a mouse, keyboard, trackball, touchpad, touch-sensitive display, or stylus.

CLAIMS

1. A method for displaying icons on a computer system, comprising the steps of:

displaying an graphic icon on a computer display;

when the icon is selected, displaying a manipulation graphic corresponding to the icon; and

as the manipulation graphic is altered by a user, altering the size, shape, and rotation of the icon on the display accordingly,

wherein the manipulation graphic ismay be altered in three dimensions.

2. The method of claim 1, wherein the icon is a three-dimensional icon.

3. The method of claim 1, wherein the manipulation means comprise graphic handles by which the means can be manipulated.

4. The method of claim 1, wherein the manipulation graphic is manipulated by a user using a computer mouse.

5. A method for displaying icons on a computer system, comprising the steps of:

displaying an graphic icon on a computer display;

when the icon is selected, displaying a manipulation graphic corresponding to the icon;

as the manipulation graphic is altered by a user, altering the size, shape, and rotation of the manipulation graphic accordingly; and

when the user has finished altering the manipulation graphic, altering the size, shape, and rotation of the icon to correspond to the modified size, shape, and rotation of the manipulation graphic, and displaying the altered icon,

wherein the manipulation graphic is altered in three dimensions.

6. The method of claim 5, wherein the icon is a three-dimensional icon.

7. The method of claim 5, wherein the manipulation means comprise graphic handles by which the means can be manipulated.

8. The method of claim 5, wherein the manipulation means are manipulated by a user using a computer mouse.

9. A data processing system, comprising:

a microprocessor;

a memory connected to be written to and read from by the microprocessor;

a display operatively connected to be written to by the microprocessor; and

a user input device connected to be read by the microprocessor, wherein a three-dimensional user interface and three-dimensional icons are displayed on the display, and the size and shape of the icons can be manipulated in three dimensions using the user input device.

10. The system of claim 9, wherein the icons are put into a manipulation mode before the icons are manipulated.

11. The system of claim 9, wherein when the icons are to be manipulated, a plurality of manipulation handles are displayed, and the handles can be manipulated using the user input device.

12. A computer program product within a computer usable medium, comprising:

instructions for displaying an graphic icon on a computer display;

instructions for enabling the icon to be selected by a user;

instructions for displaying a manipulation graphic corresponding to the icon when a user has selected the icon;instructions for modifying the size, shape, and rotation of the manipulation graphic according to how the manipulation graphic is manipulated by a user;

instructions for modifying the size, shape, and rotation of the icon to correspond to the modified size, shape, and rotation of the manipulation graphic, when the user has finished manipulating the manipulation graphic; and

instructions for displaying the modified icon,

wherein the manipulation graphic is manipulated in three dimensions.

13. The computer program product of claim 12, wherein the icon is a three-dimensional icon.

14. The computer program product of claim 12, wherein the manipulation graphic comprises graphic handles by which the manipulation graphic can be manipulated.

15. The computer program product of claim 12, wherein the manipulation graphic is manipulated by a user using a computer mouse.

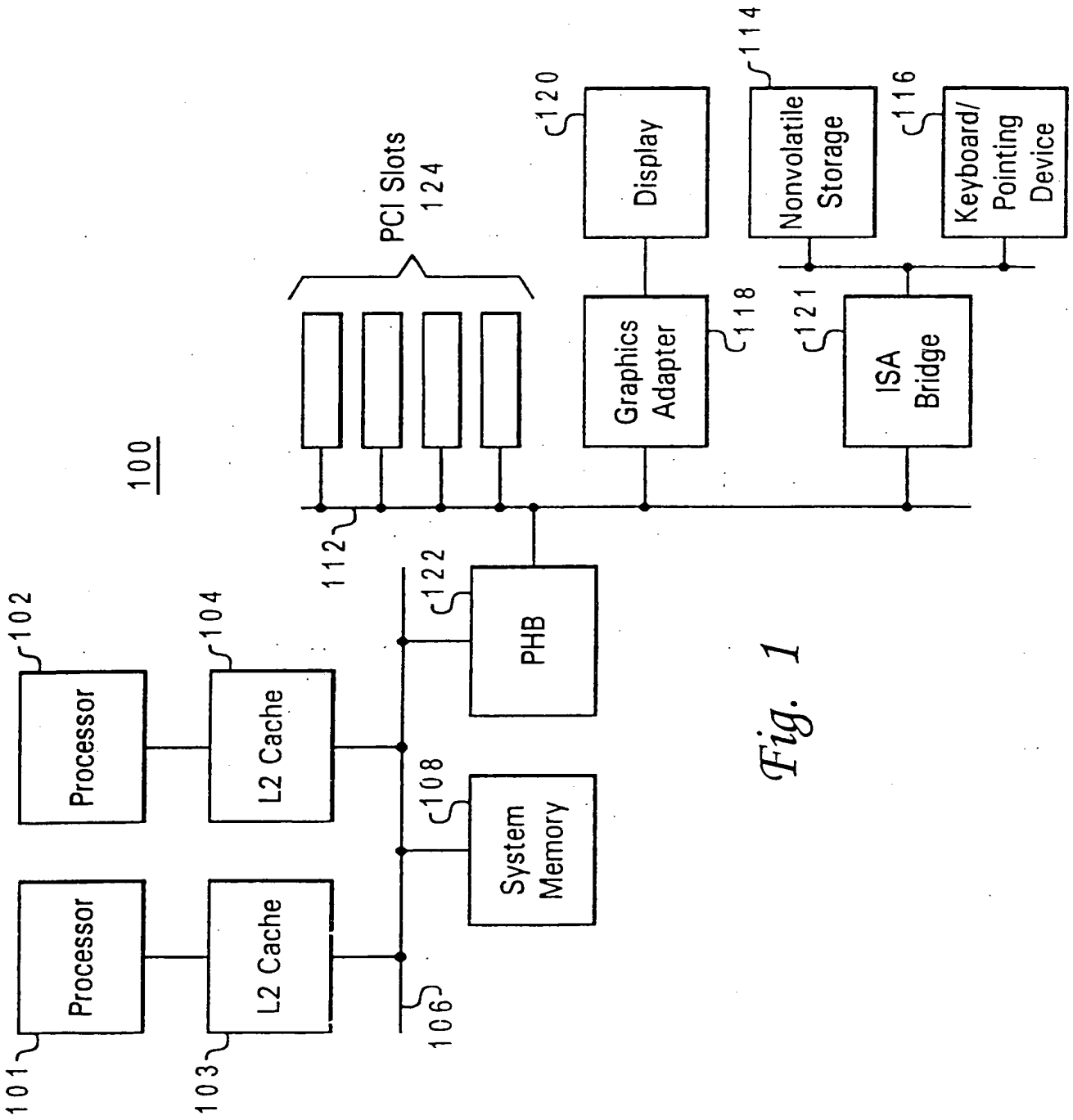

Fig. 1

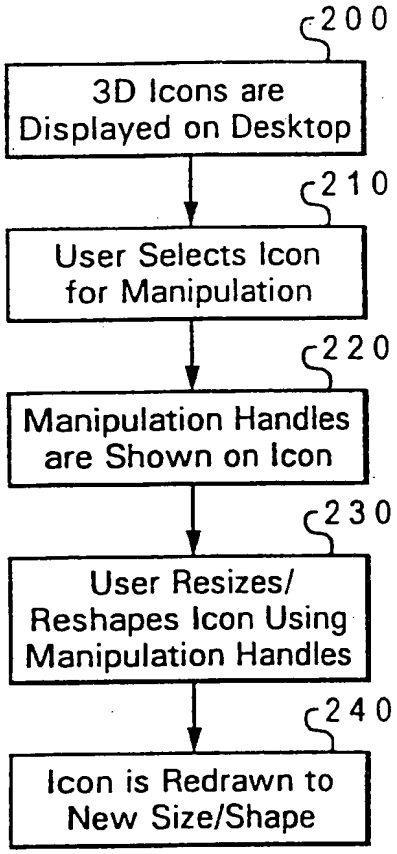
200
3D Icons are Displayed on Desktop
210
User Selects Icon for Manipulation
220
Manipulation Handles are Shown on Icon
230
User Resizes/ Reshapes Icon Using Manipulation Handles
240
Icon is Redrawn to New Size/Shape

Fig. 2

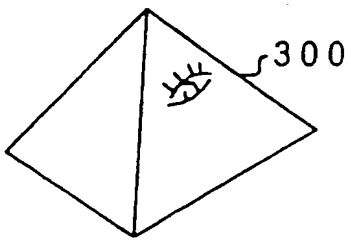

Fig. 3

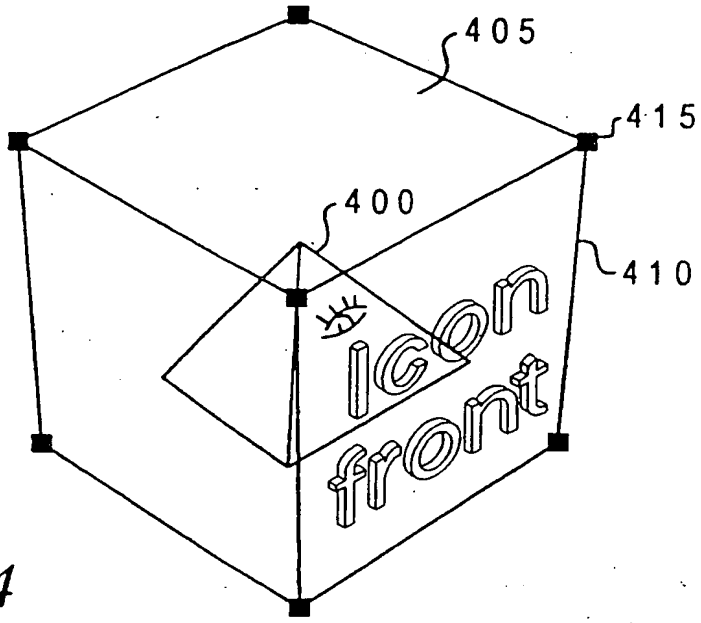

Fig. 4

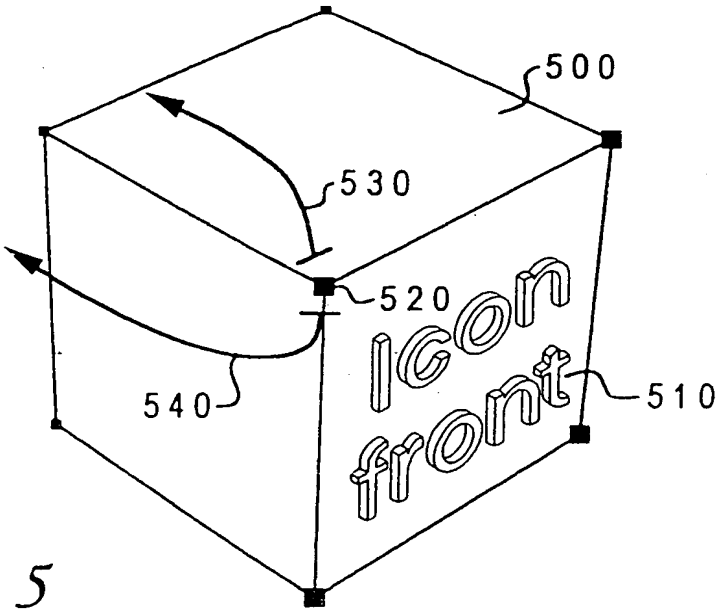

Fig. 5

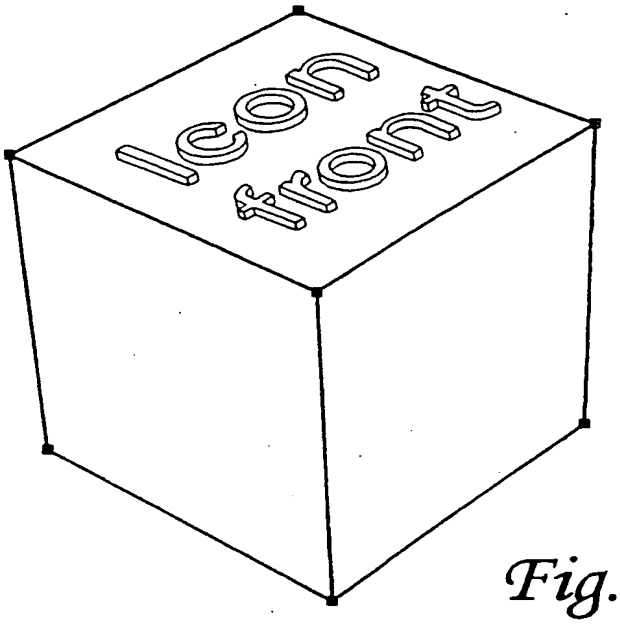

Fig. 6

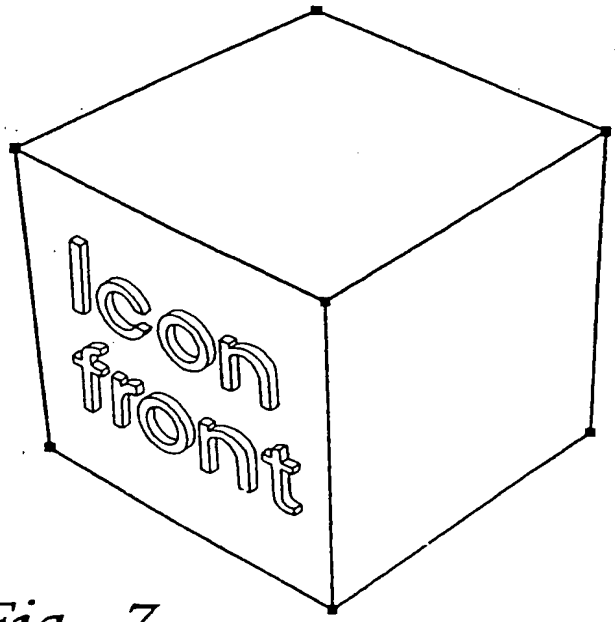

Fig. 7

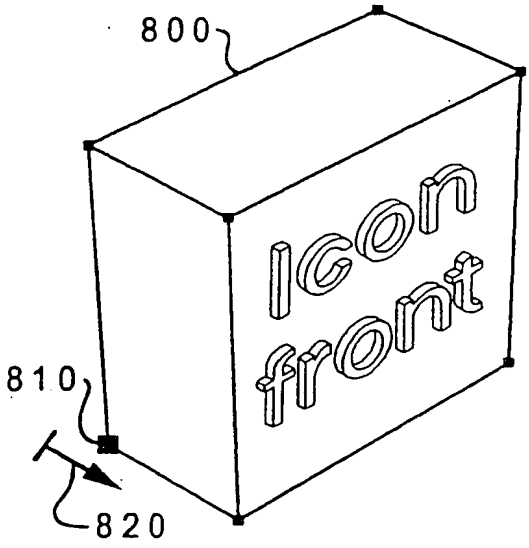

Fig. 8

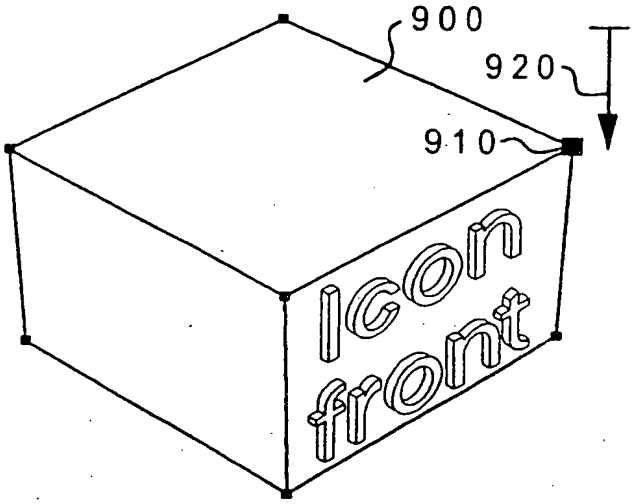

Fig. 9

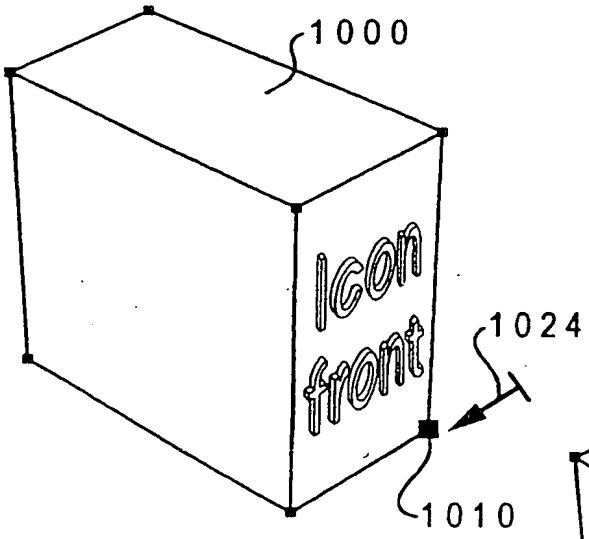

Fig. 10

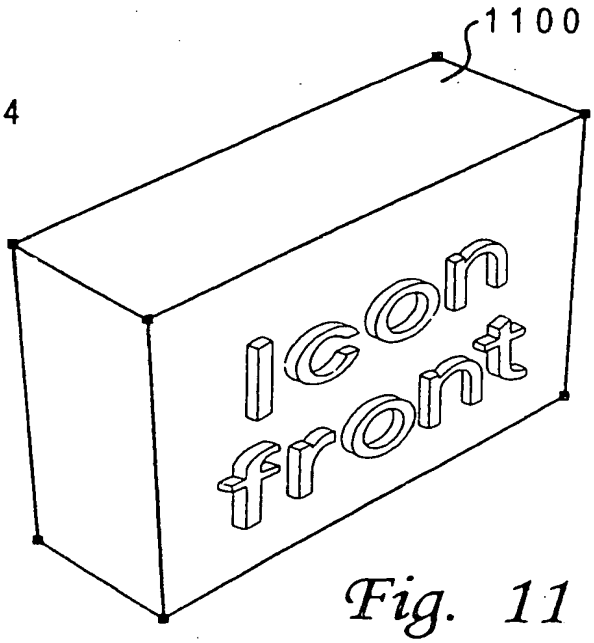

Fig. 11

INTERNATIONAL SEARCH REPORT

Inte onal Application No
PCT/GB 00/01802

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F3/033 G06F3/023

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
WPI Data, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 583 977 A (SEIDL ROBERT) 10 December 1996 (1996-12-10) column 6, line 1 -column 8, line 8 column 19, line 36 -column 55 column 21, line 10 - line 33 figures 1-39	1-15
X	EP 0 559 374 A (IBM) 8 September 1993 (1993-09-08) the whole document	1-15
X	US 5 602 564 A (FUJITA TAKEHIRO ET AL) 11 February 1997 (1997-02-11) column 15, line 44 -column 17, line 13; figures 23-28	1-15

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
12 September 2000	20/09/2000

Name and mailing address of the ISA	Authorized officer
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Form PCT/ISA/210 (second sheet) (July 1992)

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